DOCUMENT RESUME

ED 029 463 EF 003 125

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The Design, Development and Administration of Educational Facilities. A Conceptual Framework.

Wisconsin Univ., Madison. ERIC Clearinghouse on Educational Facilities.
Pub Date Feb 69
Note-25p.
EDRS Price MF-$0.25 HC-$1.35
Descriptors-*Conceptual Schemes, *Design, *Educational Administration, *Educational Specifications, *Environment, Information Processing, Models, Taxonomy

Three outlines prepared by an ERIC Clearinghouse to assist in the classification of subject matter in the field of educational facilities. The first outline contains elements of the educational environment which are related to facilities. The second is concerned with the design, development and administration of those facilities. The third section is a description of the ERIC System and the activities of the ERIC Clearinghouse on Educational Facilities. (FPO)

ED029463

CLEARINGHOUSE ON
EDUCATIONAL
FACILITIES

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# THE DESIGN, DEVELOPMENT AND ADMINISTRATION OF EDUCATIONAL FACILITIES

## A Conceptual Framework

EF003125

# THE DESIGN, DEVELOPMENT AND ADMINISTRATION OF EDUCATIONAL FACILITIES

## A Conceptual Framework

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

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A State-of-the-Art Paper

By

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Prepared for the

ERIC/Clearinghouse on Educational Facilities
The University of Wisconsin
Madison, Wisconsin

February, 1969

PUBLICATIONS OF ERIC/CEF

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## FOREWORD

The ERIC Clearinghouse on Educational Facilities has been drawing together information about educational facilities since 1967. The need to map or conceptualize this field of interest became apparent almost at once. With that in mind, three members of the clearinghouse advisory council were asked to react to an outline prepared by clearinghouse personnel and to suggest ideas which would be useful both in describing the field and in exploring it. The three members of the advisory council are George Collins, Assistant Commissioner, School Facilities and Related Services, Massachusetts State Department of Education; John G. McKevitt, Assistant Vice-President, Temple University; and Bob H. Reed, Caudill, Rowlett and Scott, Architects. This paper is an outgrowth of their work. Their varied backgrounds--elementary-secondary education, higher education, and architecture--have helped to produce a conceptual framework which may be regarded as a first step toward a continuous description and evaluation of this field of research and development.

The outlines which have been developed are used by the clearinghouse on the classification of the subject matter of the field. The first outline (Appendix A) contains elements of the educational environment which are related to facilities. The second outline (Appendix B) covers the design, development, and administration of educational facilities. Together, these two outlines encompass the content, the substance, and the processes associated with the specifications of functions, the containment of these functions, and the means by which one is converted into the other.

A description of the ERIC System and the activities of ERIC/CEF may be found in Appendix C.

Howard E. Wakefield
Director

# INTRODUCTION

The need for information has always been great, but never has it been more important than it is today.

This need is created in part by the speed at which information is consumed and in part by the high rate at which it changes or becomes obsolete. In like fashion, the importance of information is increased rather than diminished by the higher rate at which it changes today. The statistics about a given condition or community are useful for shorter and shorter periods of time. In response to the need, vast quantities of information are being compiled in many places and for many purposes. It is now virtually impossible for any one person to obtain, read, and organize all the information available in an established area of knowledge.

This explosion of information and knowledge is beneficial in one sense; it is muitiplying our resources at a tremendously rapid rate. Out of the ever larger arrays of data, greater numbers of combinations of data are made possible the effective synthesis of existing information is therefore growing comparably in importance.

As information accumulates, misinformation is often included. Josh Billings has been quoted as saying "it ain't ignorance that causes so much trouble; it's folks knowing so much that ain't so." This condition is corrected to some extent by a comprehensive approach to information analysis--i.e., the misinformation, like scribal errors, is cancelled out when exposed to a more complete array of information.

However, the large and rapid accumulation of information and knowledge in some fields has made it exceedingly difficult to classify materials. In fact the perfect system of classification has yet to be developed in most fields of knowledge. A comprehensive informational system especially needs to be developed in these fields in order to accommodate new discoveries and changes.

The problem seems overwhelming when one considers the intricacies of the process of planning new facilities. It is particularly critical to persons involved in planning, creating, and administering educational facilities. Every discipline engaged in the search for knowledge must occupy and use space in that endeavor, but certain professional fields of study are responsible for the design and construction of space used for educational purposes. The principal professional fields in that respect are architecture, education, and engineering.

The problem of information management is important because decisions about educational facilities, once they have been carried out, are difficult to rescind. The facilities are both durable and visible. It is important, also, because of recently uncovered knowledge about the effects of the physical environment on educational productivity. There is a growing awareness of the crippling influence that a hostile environment can have on the efforts of people to be educationally productive. This is a particularly disturbing realization when one considers the education of children in their formative years.

Apparent as are educational facilities, it is difficult to describe an educational facility.. It is difficult because each of the two terms "educational" and "facility" has very broad boundaries. One learns in

many ways and in every circumstance of life. Yet, the substitution of organized experience calls for methods and materials which define education more narrowly. In like fashion, any artifact is a facility, but many persons think of buildings when the word is used. The imprecision with which such terms are used becomes a formidable obstacle when an effort is made to seek and classify information about educational facilities.

What follows here is not the resolution of this challenge for the universe of educational facilities information. That would be much too pretentious. Instead, it seems appropriate to explore the information universe in the hope that we will be able to discover rather than to contrive an orderly and useful system of relating information within that universe.

An unattractive alternative to this is to regard the universe of educational facilities information as made up of fragments or bits of information which cannot be usefully classified. If this conclusion is drawn, the challenge is of a different order and character than has been assumed here. We can come back to this at another time after exploring the first assumption.

## Organizing Information About Educational Facilities

While the current expansion of knowledge and information must be accepted as a major achievement and benefit of our age, it must also be recognized as a major challenge to our ability to discriminate adequately and to apply the potential benefits of knowledge appropriately. Without appropriate applications, the abundance of information is only an unjustified burden. The challenge, then, is to convert the "information

overload" into an informational system to serve the producer and the user effectively and conveniently.

The first step is to create a prototype system for classifying information about educational facilities or for use in their design, development, or administration. Such taxonomic efforts can easily generate dogma in the form of arbitrary classifications. The logic on which they are based may be unassailable, if one accepts the forms on which the logic is based. Much of our logic is additive in its application. If we can describe each of many parts, we presume to understand the sum of those parts. So, one searches for handles by which to take hold of the universe he is struggling to describe, to use, and to understand.

There are time-honored divisions which might be used to classify information about educational facilities: content and method, substance and setting, static and dynamic, form and function. Each of these dichotomous descriptors adds and takes away meaning. Perhaps, time or process is the more useful major dimension. Along that dimension human events occur. By one logic, a change becomes necessary and events begin to order themselves. By another, the change is anticipated. At any rate, this time-related chain of events can then be segmented, even if it seems to defy complete and definitive discrimination.

There are the precedent considerations: functions, traditions, or conditions. These considerations include existing facilities, the uses made of them, and the influencing environment. There are then the means by a change in or adaptation to the precedent considerations is made. These means are procedural and sequential in character. Finally, there is the consequent event or product. While in one sense the product is

the effectiveness of the learning which is accomplished in educational facilities, it is only to that learning which can be directly associated with facilities that the concept is applied.

In the creation of educational facilities, the precedent considerations would include such functions as learning and teaching, performing, socializing, living and serving. In Gilbrethian fashion, perhaps all these functions could be reduced to a number of distinctive task requirements such as visual tasks in two, three, or four dimensions.

The products are not difficult to perceive, consisting as they do of the created containments or environments in which educational tasks will be performed. Such environments are themselves a constellation of individual entities extending from the smallest unit of space to a complex of such entities which circumscribes all the intended functions.

The linkage is provided by procedures important to the development of facilities. The names by which these procedures are known include resource allocation, planning, programming, utilization, evaluation and demolition.

The universe, then, consists of function, process and containment. It draws from the past record of such activities, duly considers the current circumstances, and lights a pathway into the future. Its substance is the concern of the architect, the engineer, and the educator. The educator must be responsible for knowledge of function and the architect and engineer for knowledge of the strategies of containment. They all share knowledge and concern for the linking processes.

Let us assume that there is a means of ordering the universe of information relating to educational facilities. Our first effort would

be to identify and classify the educational activities which provide the "content" of that universe. Our second effort might be to identify and describe the entities which constitute the forms, functions and impositions which constitute the "substance" of that universe. Finally, we must attend to the "processes" by which we recognize and reconcile "content" and "substance".

If the objective is to develop an environment for a learning activity, our interest would be in knowledge and information available about that activity, and about the facilities which in fact or in theory, in experience or in experiments, relate to that activity and to the process involved in planning, programming, designing, and/or building that facility.

What we have then is a three part, expanding universe (content, substance, and process) which encompasses a wealth of information from a multitude of fields--educational theory and practice; social behavior; architecture and engineering; administration and finance; building techniques and urban planning to name just a few. The users of such an information system extend through an equally broad span of interests and responsibilities. Yet, in their approach to the field of educational facilities, each has an equally great need for a logically constructed system of compiling and relating information.

The outlines appended to this statement represent a first attempt by the ERIC Clearinghouse on Educational Facilities to describe and order the universe of information related to the field. It becomes at once a guide for the more elaborate mapping of that universe.

APPENDIX A

Educational Environments
-An Outline-

I. The Need for Educational Environments

II. The Objectives of Educational Environments

III. Identification of Educational Environments

A. Learning and Sustained Occupational Task Environments

1. Classrooms

a. Lecture
b. Seminar

2. Activity-Workrooms

a. Laboratories
b. Instructional shops
c. Maintenance shops

3. Instructional Materials Centers

a. Libraries
b. A-V Center
c. Resource Center

4. Assembly Rooms

a. Auditorium
b. Theater
c. Multi-media center

5. Physical Development Spaces

a. Gymnasiums
b. Swimming pool
c. Playing fields

B. Service and Connecting Areas Where the Physical Environment Affects Human Movement and Performance

1. Food Preparation and Service

a. Cafeterias
b. Kitchens

2. Recreation and Rest Areas

   a. Lounges
   b. Commons
   c. Game rooms
   d. Reading rooms

3. Circulation

   a. Corridors
   b. Stairways
   c. Elevators
   d. Escalators
   e. Walkways
   f. Entryways and foyers

4. Service Areas

   a. Locker areas
   b. Shower rooms
   c. Dressing rooms
   d. Toilets

## IV. Elements of Educational Environments

### A. Sites

1. Soil Conditions

   a. Soil temperature
   b. Drainage

2. Topography
3. Site Orientation
4. Water Supply
5. Weather Conditions

   a. Air temperature range
   b. Precipitation
   c. Air movement

      (1) Heating
      (2) Cooling
      (3) Humidity
      (4) Pressure
      (5) Odor

   d. Natural light

6. Site Development Materials

    a. Concrete
    b. Stone
    c. Brick
    d. Wood
    e. Asphalt

7. Relationship of Existing Structures
8. Land Formation Surrounding Site

    a. Views
    b. Land use
    c. Access
    d. Transportation
    e. Topography

B. Buildings

1. Architecture
2. Structural Enclosures
3. Exterior Materials
4. Interior Materials

    a. Floor
    b. Walls
    c. Ceiling
    d. Equipment

5. Building Orientation
6. Relationship to Existing Buildings
7. Thermal Studies

    a. Exterior materials
    b. Interior materials
    c. Equipment

8. Dimensions of Task Surround

    a. Ceiling heights
    b. room Dimensions
    c. Study enclosures

9. Space Relationships

    a. Task relationships
    b. Traffic flow
    c. Orientation
    d. Horizontal movement
    e. Vertical movement

10. Quality of Air

    a. Heating
    b. Cooling
    c. Humidity
    d. Ventilation
    e. Pressure
    f. Odor

11. Lighting Studies

    a. Source
    b. Distribution
    c. Intensity
    d. Color
    e. Reflection

12. Acoustical Studies

    a. Noise level
    b. Noise transference
    c. Articulation
    d. Reverberation

13. Surface Color

    a. Floor
    b. Walls
    c. Ceiling
    d. Equipment
    e. Display areas

14. Color Temperature of Surround

    a. General surround
    b. Immediate surround
    c. Artificial lighting

15. Texture

    a. Patterns
    b. Size
    c. Contrasts

C. Equipment

1. Analysis of Task Performance
2. Performance Specifications
3. Anthropometry and Human Engineering
4. Body Measurements
5. Body Movement Studies

6. Visual Perception

    a. Visual angles
    b. Distance
    c. Viewing time
    d. Sight line

7. Standing and Sitting Posture
8. Body Change and Behavior
9. Fatigue and Stress
10. Space Requirements for the Seated Operator
11. Space Requirements for the Standing Operator
12. Body Support in Task Performance
13. Cultural Implications
14. Safety Requirements
15. Structural Components
16. Mechanical Performance
17. Material Studies
18. Thermal Characteristics
19. Form
20. Pattern and Texture
21. Color
22. Color Temperature
23. Graphic Forms

APPENDIX B

# The Design, Development and Administration of Educational Facilities

-An Outline-

I. The Need for Educational Facilities

II. The Objectives of Educational Facilities

III. Design of Educational Facilities

A. Personnel Involvement

1. Staff
2. Community
3. Specialists - Educational and Design
4. Other Governmental Units

B. Development of Educational Specifications

1. Program Analysis

a. Groupings
b. Categories of enrollment
c. Schedule of activities
d. Physical movement
e. Instructional activities
f. Equipment and furniture
g. Special-use facilities
h. Curricular, co-curricular, auxiliary

C. Analysis of Plant Needs

1. Community of Client Survey

a. Resources
b. Demographic characteristics
c. Land use
d. Planning and development
e. Government structure

2. Educational Program Survey

a. Public and Private organizations
b. Curriculum development
c. Current teaching procedures
d. Current trends
e. Special needs
f. Community use

3. Enrollment Projection

   a. Birth Rate
   b. Census
   c. Projection techniques

D. Analysis of Resources

1. Factors Affecting Educational Plant

   a. Standards, guides, codes
   b. Topography--land value and use
   c. Weather
   d. Health and safety restrictions
   e. Community and client attitudes

2. Evaluation of Existing Plants

   a. Survey tasks

      (1) Inventory
      (2) Structural evaluation
      (3) Educational usefulness
      (4) Needed renovation and modernization
      (5) Reconciliation to master plan

   b. Utilization or capacity studies

      (1) Definition of capacity
      (2) Student-station square footage standards
      (3) Staff-station square footage standards

3. Financial Resources

   a. Sources of revenue
   b. State supported patterns
   c. Federal support patterns
   d. Local support

      (1) Tax levies
      (2) Wealth
      (3) Effort
      (4) Expenditures
      (5) Indebtedness
      (6) Legal indebtedness limitations
      (7) Private contributions
      (8) Tuition and fees

IV. Development of Educational Facilities

A. Architectural Services

1. Services
2. Selection
3. Contract
4. Bonds

B. Site Selection and Development

1. Characteristics
2. Relation to Community Planning
3. Location
4. Acquisitions

C. Plant Construction Documents

1. Preliminary drawings
2. Working Drawings and Specifications
3. Bidding and Contract Award

D. Construction Phase

1. Architectural Supervision
2. Bonding

a. Legal costs
b. Administrative costs
c. Change orders
d. Payment schedule
e. Investment schedule
f. Completion schedule
g. Construction insurance
h. Contractor performance bond

E. Criteria for Selection of Furnishings and Equipment

V. Administration of Educational Facilities

A. Equipment and Supplies
B. Schedules

1. Utilization
2. Allocation

C. Maintenance
D. Repairs
E. Operations
F. Alterations

G. Management

1. Planning
2. Organization
3. Controls
4. Personnel

    a. Selection
    b. Training
    c. Supervision

H. Materials
I. Safety
J. Security

APPENDIX C

## ERIC CLEARINGHOUSE ON EDUCATIONAL FACILITIES (ERIC/CEF)

The U.S. Office of Education awarded a contract to the University of Wisconsin to establish an ERIC Clearinghouse on Educational Facilities in Madison in July, 1967. In September, 1967, ERIC/CEF began to process documents. The University maintains three research units whose major interest is educational facilities. The three units are: Cooperative Educational Research and Services (CERS), Environmental Design Center (EDC), and the University Facilities Research Center (UFRC). These centers with technical assistance from the Library School and Computer Sciences Department comprise ERIC/CEF. A five-man executive committee made up of a representative from each unit is responsible for operation of the clearinghouse.

A fifteen-man national council was formed to advise ERIC/CEF. During the past year the council has advised the clearinghouse on such matters as (1) objectives of the clearinghouse, (2) boundaries of clearinghouse interest, (3) establishment of a network of document sources, (4) criteria for the classifying of documents, and (5) nature and extent of clearinghouse services.

In January, 1968, ERIC/CEF submitted its first official input to the ERIC monthly abstract journal, Research in Education. Since then approximately 500 documents have been submitted from the clearinghouse for inclusion in Research in Education. In addition, approximately 2,500 documents have been accumulated in a local collection. This local collection is one which will serve more specialized interests.

ERIC/CEF intends to make the entire collection known in the form of selected bibliographies, state-of-the-art papers, annotated reference lists, and occasional papers.

When published, they will be made available from the ERIC Document Reproduction Service, The National Cash Register Company, 4936 Fairmont Avenue, Bethesda, Maryland, 20014.

Research in Education is the announcement bulletin for the ERIC system. All new documents added to the ERIC collection (about 1,000 per month from all clearinghouses) are announced through this publication. An abstract of each document is provided along with the usual identifying information, and author, institution, and subject-matter indexes. Research in Education also contains an abstract of, and indexed information about, all new project awards made through the Bureau of Research, USOE. Research in Education is available through the Superintendent of Documents, U.S. Government Printing Office, Washington, D. C. 20402, at $21 per year, domestic, $26.25 foreign; (12 issues per year).

Copies of all reports cited in Research in Education (except for copyrighted items available only from publishers) are forwarded to the ERIC Document Reproduction Service (EDRS) for microfilming and distribution. Prices for documents are listed with each citation in Research in Education. Documents can be obtained in either microfiche or hard copy form. Microfiche is a flat sheet of 4 x 6 inch film containing up to 60 pages. Inexpensive and easy-to-use equipment is available for reading microfiche (Tate & Wolf, 1967).[1] Hard copy refers to reproduction of documents in a form that can be read without optical aids. Advantages of the microfiche reporduction are its low cost and reduced storage space. A 60 page document on microfiche costs either 8.4 cents or 25 cents, depending on whether it is purchased as part of a standing order for all ERIC documents cited in Research in Education or whether it is purchased as a single document. The hard copy price is 5 cents per page. Thus, the same 60 page document would cost $3.00 in hard copy. Detailed ordering information is provided in each issue of Research in Education and in each index to special collections developed by ERIC.

Current Index to Journals in Education. In cooperation with ERIC, Crowell, Collier and Macmillan, through its Information Sciences subsidiary, will be producing the Current Index to Journals in Education (earlier called the Journal Index to Education). Publication date is tentatively set for April, 1969. The Current Index to Journals in Education will cover articles in over 200 education journals and additional periodicals in related fields. This new index is a companion service to Research in Education (RIE) but does not contain abstracts.

Recent articles will be collected and indexed by the 19 clearinghouses that comprise the ERIC network. This material will be indexed with terms from the THESAURUS OF ERIC DESCRIPTORS, a vocabulary developed by subject experts of the various ERIC Clearinghouses.

The Current Index to Journals in Education, a computer-generated index, will contain a main-entry section, an author index, plus an index to source journals. The Current Index is cumulated annually and semi-annually.

One of the unique features of Current Index to Journals in Education is the coverage devoted to peripheral literature relating to the field of education. This essential feature will assure access to important contributions in periodicals which fall outside the scope of education-oriented literature. Prices are $34.00 for 12 monthly issues or $29.50 for a pre-publication subscription. Cumulations also will be available:

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1. The Tate and Wolf article is available as a reprint for 50 cents a copy. Requests should be sent to: The Executive Secretary, National Microfilm Association, 250 Prince George Street, P. O. Box 386, Annapolis, Maryland 21404.

$24.50 for the annual only and $12.50 for a semi-annual; both the semi-annual and annual, $35.00; however, if the semi-annual and annual are ordered along with a subscription for the 12 issues, their cost is $30.00. Total cost for the 12 issues and the semi-annual and annual cumulations to $64.00.

For further information and to place orders, write: CCM Information Sciences, Inc., 886 Third Avenue, New York, New York, 10022.

Several tools for helping persons use the ERIC system are available, including:

1. A brochure, ERIC Can Help: copies are available free from ERIC/CEF, 606 State Street, Madison, Wisconsin 53703.

2. The Thesaurus of ERIC Descriptors (First Edition), December, 1967, (OE 12031) contains about 3,100 descriptors and is used to select terms for searching the subject indexes of all ERIC bulletins: $2.50. Available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D. C. 20402.

3. The Thesaurus of ERIC Descriptors (First Edition) Supplement No. 1, March, 1968, (OE 12031-1) adds approximately 400 new descriptors, with a rotated display of all ERIC Descriptors: $2.00. Available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D. C. 20402.

4. Research in Education Annual Index--1967 Reports, combines the indexes to reports cited in the first 14 issues of Research in Education: $3.25. Available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

5. Research in Education Annual Index--1967 Projects, combines the indexes to projects cited in the first 14 issues of Research in Education: $3.25. Available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D. C. 20402.

6. Research in Education: Semi-Annual Index, Jan.-June, 1968: $3.75. Available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D. C. 20402.

7. How To Use ERIC, a manual on how to use ERIC: 20 cents. Available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D. C. 20402.

Special collections of documents also are organized through ERIC. In each case an abstract-index volume is prepared and all documents are available as a set or by individual reports through EDRS. A list of the special collections now available through ERIC includes:

1. The ERIC Collection on the Disadvantaged includes 1,740 documents; microfiche for $230; with two indexes: Catalog of Selected Documents on the Disadvantaged, a Number and Author Index (OE 37001), 65 cents, and a Subject Index (OE 37002), $3.00. Indexes available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D. C. 20402.

2. Office of Education Research Reports 1956-1965: 1,214 research reports on projects supported by USOE in the period 1956-1965; microfiche for $280; the resume volume (OE 12029) $1.75, and the index volume (OE 12028) $2.00, available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D. C. 20402.

3. Pacesetters in Innovation: Fiscal Year 1966: 1,075 Projects to Advance Creativity in Education (PACE) approved for support by USOE in fiscal year 1966; microfiche $100; resume and index volume (OE 20103) $2.50, available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D. C. 20402.

4. Pacesetters in Innovation: Fiscal Year 1967: Projects to Advance Creativity in Education (PACE) approved for support by USOE in fiscal year 1967; microfiche $120; resume and index volume (OE 20103-67) $2.50, available from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402.

5. Number and Subject Index of Selected Documents of Higher Education: 845 reports, microfiche $115; Index available through the ERIC Documents Reproduction Service as ED 012 110: $.50 on microfiche, $3.24 on hard copy.

6. Manpower Research, Inventory for Fiscal Years 1966 and 1967: 393 reports from projects funded by OEO and the Departments of Labor, HUD, and HEW; microfiche $60; the resume and index volume (OE 12031) (in press).

Other special collections will be developed from time to time. Information about them will be provided in a special notice in Research in Education.

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